Urban Consolidation Centre (UCC), urban freight, city logistics system

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URBAN FREIGHT CONCEPTS AND PRACTICE: WOULD A TRADITIONAL UCC SCHEME WORK?

Summary. This paper aimed to show that planner-led UCC solutions are untenable in the modern liberal economy. Our analysis suggests that the top down imposition of a Urban Consolidation Centre (UCC) works only in clearly controlled domains. We have studied urban freight concepts and practice and it is our contention that most UCC initiatives fail in a liberal economy where free choice and market economics apply. In underpinning this contention we have compiled, analysed and categorised a set of the UCC schemes known to have operated, left evidence of their existence, and been captured by the research community. In this paper we present two case study examples that show that within the construction sector UCCs can be utilised successfully to create efficient and forward-thinking logistics operations. Whilst it might be true for the construction sector, we have not found evidence that it might be true for other sectors.

ГОРОДСКИЕ ГРУЗОВЫЕ КОНЦЕПЦИИ И ПРАКТИКА: РАБОТАЮТ ЛИ ТРАДИЦИОННЫЕ СХЕМЫ ГОРОДСКИХ КОНСОЛИДАЦИОННЫХ ЦЕНТРОВ (UCC)?

Аннотация. Целью данной статьи было показать, что планируемые под руководством городских консолидационных центров (UCC) решения являются несостоятельными для современной либеральной экономики. Наш анализ показывает, что управление сверху вниз для UCC работает только для четко контролируемых зон. Мы изучили ряд городских грузовых концепций и практических использований, что привело к нашему утверждению, что инициативы большинства UCC ошибочны в либеральной экономике, где применяются свобода выбора и рыночная экономика. Для обоснования этого утверждения мы составили, проанализировали и классифицировали множество схем UCC, для которых известно, что они работают, позволяя не доказывать их существования. В этой статье мы приведем два примера, которые показывают, что в строительном секторе UCC могут быть успешно использованы, выполняя эффективные и дальновидные логистические операции. Хотя это может быть верно не только для строительной отрасли, мы не нашли доказательств того, что это может быть верно и для других секторов.

Within the context of a liberal economy, a highly urbanised society and transport growth outstripping economic growth, many cities have experienced growing problems with the impact of goods (and service) delivery. These problems include: traffic congestion, illegal parking, just-in-time delivery,

pollution, air quality, noise, intrusion upon citizens and environmental impact. Although freight is a minority urban road user, with estimates ranging from 10-18% of road traffic (European Commission, 1998) to 20% and 30% of vehicle kilometres (Dablanc, 2007) it is unpopular with other road users and is often given the lowest priority in planning and practice after public consultation (SYITA, 2001). The environmental impact of freight can be higher than other road users: 40% of air and noise pollution, and a greater chance of fatality in an accident involving (but not necessarily caused by) a freight vehicle (Lefler, 2004). In historic city centres, larger vehicles can block narrow road whilst unloading, as can double parked vans. As the BESTUFS project [16] has shown in its various workshops and reports, this negative view of freight is nuanced, often freight causes inconvenience due to lack of provision for legitimate activities, such as absence or misuse of loading bays. The freight operators also suffer impacts to their activities, such as mutually incompatible time access systems, congestion and limited access to delivery locations. (Abel & Karrer, 2006)

To address these issues several City Logistics concepts have been developed on the basis that "new" organizational strategies for urban freight transportation are needed. The fundamental idea underlying these concepts is that we must stop considering each shipment, firm, and vehicle individually; instead, we should consider them as components of an integrated logistics system, where shippers, carriers, and movements are coordinated and loads of different customers and carriers are consolidated into the same "green" vehicles (see also Benjelloun & Crainic, 2008). This is a systematic approach appealing to transport planners used to managing public transport, but does it fit within a modern deregulated economy?

1. SYSTEMS FOR URBAN FREIGHT

A fashionable and apparently innovative solution is the Urban Consolidation Centre (UCC). Various definitions of UCCs have been proposed and debated. For the purposes of our research we would accept the following definition:

> *... a UCC is best described as a logistics facility that is situated in relatively close proximity to the geographic area that it serves, be that a city centre, an entire town or a specific site (e.g. shopping centre), from which consolidated deliveries are carried out within that area. A range of other value-added logistics and retail services can also be provided at the UCC.* (Browne et al 2005)

Cities create and operate urban consolidation/distribution centres in order to:

- Reduce the number of delivery vehicles (especially less clean trucks and other vehicles using fossil fuels) operating in the central areas of the cities.
- Reduce greenhouse gas emissions from freight transport and improve air quality in the cities.
- Facilitate the operations with freight vehicles in loading/unloading areas within the cities and delivery bays.
- Reduce the conflict on the streets of the cities.
- Ameliorate delivery services to retailers (on time deliveries to date).
- Provide opportunities for added – value services to all the customers (services with no lost or damaged stock).
- Improve the quality of the entire service provided.

A clear customer-supplier model of urban access has to be developed and implemented. City logistics and UCCs cannot be viewed and studied in isolation, but rather in the context of the entirety of supply chains that typically cross the geographical boundaries of urban areas. The results of UCCs researched and feedback during the BESTUFS project shows that there is almost no account taken of the wider pre-existing supply chain networks, indeed most initiatives have focused on large operators/shippers who already have their own networks and not targeted the more complex and yet more appropriate pool of small operators and receivers. The issue of adequate allocation of scarce resources of urban access plays a significant role in achieving planners' goals of urban sustainability.

In the near past, it was thought that rail could provide reliable and efficient freight transport to, from and through urban areas. Where feasible, distribution strategies that transfer freight from urban roads to environmentally sustainable rail and marine systems potentially optimise transport infrastructure usage and relieve pressures on finite urban road space and demands for road developments (Dinwoodie 2006). However, as stated by Robinson and Mortimer (2004 a) rail has not been able to match the technical, operational, commercial and product/service development initiatives that the road transport sector has repeatedly been able to implement successfully, often at timescales rail cannot achieve. Shippers are accustomed to slick, sophisticated, road-based logistics services and are very unlikely to be prepared to sacrifice these for a less capable and more costly alternative. Also, the rail freight infrastructure is very capital intensive; it needs investment and protection measures to make rail in urban freight possible and to avoid the possible loss of long-term solutions to city logistics issues (Robinson and Mortimer 2004b).

The current state of the art suggests that City Logistics & Urban Consolidation Centres are neither an uncritical success nor an unmitigated failure. This solution tends to be hailed as a success publically before failing quietly as a commercial venture. A clear example of innovative city logistics system that failed is CityCargo Tram in Amsterdam.

It had been proposed that with both political pressure based on the Push Concept: encouraging the shift from road to rail; and interventions into the sector based on the Pull Concept[1]: tram (light rail) systems for transporting freight to, from, within and though cities would become reliable providers in the urban freight market, City Cargo aimed to provide evidence for this in trial.

The operation pattern of CityCargo was: The freight to be transported was received in warehouses on the outskirts of Amsterdam, where freight was shipped in CityCargo trams. CityCargo trams took freight to locations inside Amsterdam. They were using alternative routes on the existing tram network of Amsterdam. , The routes of CityCargo trams were not explicitly fixed. Instead, the routes were specified according to demands, congestions, peaks and off-peaks. By using different routes, the CityCargo trams did not intervene with the passenger tram services. After arriving at the desired location deep inside the city of Amsterdam, the freight from the CityCargo trams was moved to “Green” Vehicles (also called E-Cars, see Fig. 1 [15]). These Green Vehicles then transported the freight to the final customer.

Fig. 1. CityCargo Tram in Amsterdam
Рис. 1. Городской грузовой трамвай в Амстердаме

[1] On “Pull and Push” Concepts the interested reader is advised to consult Hopp and Spearman (2004).

After a pilot exercise the CityCargo initiative failed as a commercial venture without subsidy, as have most other UCC ventures. It is our contention that most UCC initiatives fail in a liberal economy where free choice and market economics apply (Table 1). In underpinning this contention we have compiled, analysed and categorised a set of the UCC schemes known to have operated, left evidence of their existence, and been captured by the research community[2]. We shall not provide a detailed discussion here of the methodology and factorial analysis employed in our analysis of UCC schemes. Key to our research has been the definition of how and why a scheme succeeded or failed. The primary list in our analysis was drawn from the comprehensive list developed by Browne, with additions from BESTUFS and also recent papers on new services. It is worth noting that about one third of all UCCs originally identified in 2005 by Browne have left no discernible data for analysis.

Table 1

Simple analysis of success factors

Factor Combinations	**No**
Number of Successful Initiatives	27
Number of Successful Initiatives Viable without Subsidy	17
Number of Successful Initiatives with Controlled Locations	14
Number of Successful Initiatives with Controlled Locations and Viable without Subsidy	8
Number of Successful Initiatives without Controlled Locations	12
Number of Successful Initiatives without Controlled Locations viable without Subsidy	0
Number of Successful Initiatives with Private Venture	15
Number of Successful Initiatives with Private Venture and Viable Without Subsidy	14

Our analysis suggests that the planner-led UCC solution is untenable in the modern liberal economy. It appears that the top down imposition of a UCC works only in clearly controlled domains. Some examples are:

- airports (Heathrow),
- building sites (Hammarby, London),
- landlord controlled retail areas (Bluewater, Meadowhall) ,
- state enforced areas (Monaco) outside of the EU Single Market.

We have also seen that even within some controlled zones such as the Italian Limited Traffic Zones (LTZ) where private ventures can still compete (albeit in a disadvantaged fashion), the UCC schemes cannot survive without subsidy.

2. CASE STUDY EXAMPLES

2.1. Heathrow Consolidation Centre

The Heathrow Consolidation Centre, (HCC) located at Hatton Cross is a Logistics Consolidation Centre has been operated by Wilson James Ltd. and Mace Ltd on behalf of the British Airports Authority (BAA). The HCC acts as a distribution centre of construction materials and its main purpose is to promote the efficient flow of construction goods from supply chains to actual points of use on projects. The background for the HCC's establishment was: " *how can BAA deliver its extensive capital programme on-time, on-budget, with minimum impact upon its customers* (the travelling public and airlines)?"

The key basics of operation are: Heathrow airport typically handles 65 million passengers per annum HCC contributes to airport operations and passenger service by providing a delivery point for incoming deliveries bound for Heathrow construction activities. The goods are not stored in the con-

[2] Simple studies with no trial were excluded.

ventional sense and are brought in only when about to be used on site. Dwell times of the construction materials held seldom go beyond a week, no more than 7 days is the ideal. The LCC operates from a 20,000 sq. ft. Facility, which is former BA Engineering hanger. It comprises both covered space for goods such as: plasterboard, cement, fire alarms; together with outside space for materials capable of being exposed to weather, (such as bricks, blocks, glass, etc.).

Construction materials, and plant (excluding steel frames, ready-mix concrete, etc.), are delivered into the LCC during the daytime, in 'relative' bulk – prior to being 'called-off' by Trade Contractors (Suppliers), in the quantities required for use in the immediate future (in work-packs), following a 'just-in-time' philosophy. Many of the Heathrow projects require deliveries to be made at night, and often to sites with extremely constrained access.

The goods are delivered to the workface, not necessarily at the site entrance, using an extensive range of vehicles and mechanical handling equipment necessary to complete distributions safely, efficiently and without damage. The entire operation is reliant upon the information the HCC receives from trade contractors. Trade contractors are not responsible for the distribution process. The entire distribution is controlled and fulfilled by material handling operatives.

The HCC possesses a comprehensive programme of KPI's to measure both its performances and its impact on the construction projects that it serves (Terminals 1 -4). The operational strategy is: "*right goods, right quantity, right condition, right place and right time*", with the emphasis on continuous improvement.

Benefits experienced, as stated in the Executive Summary Report, 2004, are:

Economic benefits

- Net project construction costs can be reduced by 2%;
- Delivery costs can be reduced for material suppliers. In particular, waiting times for off-loading deliveries can be reduced by 53 minutes on average (Consolidation Centre compared to Central London sites). Additionally, 92% of delivery drivers surveyed said that they allowed an extra 30 to 60 minutes to their travel time to meet their scheduled delivery slot on City Centre sites. Lastly, the impact of any congestion charges can be mitigated;
- An improvement in plan reliability on projects by up to 5%, by increasing the certainty of material deliveries to sites and using the Consolidation Centre as a 'production buffer';
- Improved productivity - skilled trades are able to spend more time at the workface. This will become even more important as the shortage of skilled trades is forecast to worsen;
- Better planning – by using the consolidation process more disciplined planning by trade contractors is introduced;
- Improved delivery certainty – 99% successful;
- Reduced potential for theft of materials;
- Collection of unused materials for use elsewhere.

Environmental Benefits

- Reduced pollution - CO2 emissions for local delivery journeys can be reduced by up to 40%;
- Reduction of local vehicle movements – by up to 20,000kms in a 12 month period, decreasing traffic congestion and noise;
- Reduced congestion – suppliers and trade contractors deliver to the fixed point of the Consolidation Centre, rather than having to find ever-changing drop off points for different sites. In addition the Consolidation Centre distribution teams know exactly where to distribute materials to and what the local constraints are at the outset;
- Reduced waste – materials delivered to site 'just-in-time' reduces on-site damage;
- Recovery of re-usable materials, e.g. pallets, cable drums, still ages, hoardings, etc. which are often disposed of using traditional distribution methods.

Social Benefits

- Minimising the impact of construction work on the local community;
- Improved safety – reduced site storage mitigates accident risks;
- Improved security – using 'known' vehicles helps security.

Another example, deemed successful, is at Heathrow airport where a consolidation centre accepts all deliveries to the franchises around the airport and then delivers to the shops. This works, again, because the franchisee is also the airport owner, and effectively controls the entire supply chain from door to counter. A delivery reduction of 66% trips was achieved and the logistics provider is trialling it at other shopping malls around the UK.

These schemes show successful consolidation centres: in closed spaces controlled by a single authority. The British Airports Authority (BAA) controls the private space that is Heathrow, lets all the construction contracts, and runs all the franchises within the airport. Whilst it shows the great advantage of consolidation it is not an urban area, it does not operate in the normal free economy and as such it is quite incorrect to hold it up as an exemplar of an UCC.

2.2. The London Construction Consolidation Centre

The London Construction Consolidation Centre (LCCC) acts as a distribution centre and delivery service area for construction materials to four major building projects in Central London. The LCCC in South Bermondsey was funded by Transport for London, Stanhope and Bovis Lend Lease and managed by Wilson James Ltd.

The LCCC establishment followed the same concepts as of delivering materials to BAA's London Heathrow Airport. The construction materials are delivered to the LCCC ahead of the time needed on site. The LCCC acts as a production buffer, "buffering" construction materials for the sites it serves. The construction materials are delivered on a *just in time* basis, which increases efficiency, provides certainty, ensures more space and reduces labour on site.

Needless to say, in most case space is an issue of any city centre construction site. Construction works are affected by construction materials available at the site. Therefore, it is of great importance that the consolidation centre is close to the sites it serves and also large enough to store construction materials in bulk. To ensure and experience seamless operations, delivery times must be predictable. The lorries must travel in short distances on none-congested routes. The wastage must be avoided. Valuable building materials must not be lying round on site for weeks before being used. Supply Chain Configuration for the LCCC is as shown in Fig. 2 [9]. Vehicles making deliveries to the LCCC started their journeys from all over Britain. More than 340 suppliers have delivered construction materials to the LCCC. There are also deliveries to the LCCC originated from outside Britain, (e.g. Germany and Switzerland accounting for the vast majority of deliveries from outside Britain).

In the LCCC cross-docking facilities and plans were implemented to create a one-way flow system, with inbound goods entering at one end and outbound goods exiting at the other end of the site. The key basics of operation are: The LCCC worked in the following way: contractors working on the construction sites placed orders for their material requirements with their suppliers in the normal way, but instructed that the delivery was made to the LCCC, not the construction site. Contractors received notification from the LCCC when these orders had arrived. Contractors then placed a delivery order with the LCCC for the materials they required. This was assembled at the LCCC and delivered to the sites. Approximately a sixth of all the deliveries requested from the LCCC by the construction sites were needed within less than 24 hours notice (i.e. on a just-in-time basis).

The vehicles also bring recyclable packaging and unused materials back to the LCCC. This is either recycled or returned through the supply chain for re-use while all other waste is collected by another operator. The LCCC has been operated from 07:30-17:30 on Monday to Thursday and 07:30-16:00 on Friday, with 24 hour operation available if required. An integrated vehicle tracking and tracing system was used in the LCCC goods vehicles. This system can be used to create both live and historic track-

ing and vehicle management information which helped to ensure the LCCC could effectively manage the fleet.

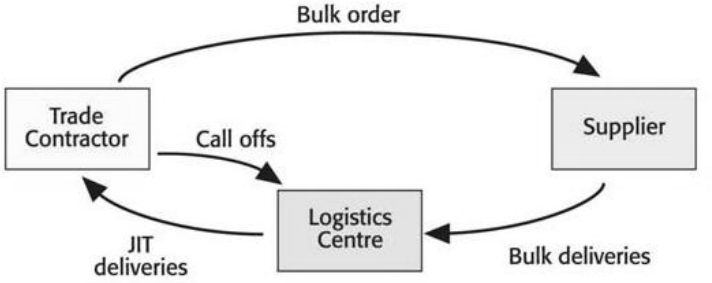

Fig. 2. Supply Chain Configuration for the LCCC
Рис. 2. Схема цепи поставок для Лондонского строительного консолидационного центра

Benefits of operating the London Construction Consolidation Centre, as stated in the Final Report, 2008, are:

- Reduction in total goods vehicle journeys to construction sites;
- Elimination of deliveries by articulated goods vehicles, significantly reduced deliveries by vans, and far greater use of rigid goods vehicles for deliveries to construction sites when using a consolidation centre;
- Associated reductions in CO2 and noise emissions, and traffic casualties;
- Increasing network capacity by reducing kerbside activity;
- Smoothing traffic, by reducing deliveries in the congested peaks;
- Improvements in delivery reliability to construction sites;
- Time savings for drivers delivering to the consolidation centre (rather than having to deliver to the construction site);
- Time savings for trade contractors working at the construction site in collecting or waiting for delivery of materials;
- Indications of reduction in material waste;
- Scope for the consolidation centre to provide packaging, waste and material return collection services for construction sites;
- Scope for the consolidation centre to provide pallet recovery, repair and recycling services;
- Job creation, specialist logistics training and qualification opportunities.

The London Construction Consolidation Centre was pointed out as best practice by Freight Best Practice funded by the Department for Transport and managed by Faber Maunsell Ltd. After the initial subsidised operation the centre was wholly adopted by the private sector and is run profitably. Why, however, does a construction UCC work as a private venture when so few others have made the transition from subsidy to stand alone operation?

The answer is the primitive nature of construction supply chains: One result of the poor supply chain management is that the level of waste generated by the construction sector. Typically, 10-15% of total materials ordered for construction projects is either unused or ends up as waste, and for some materials the figure can be as high as 45%. According to the Waste and Resources Action Programme

(WRAP) 35% reduction in this material wastage could be achieved by adopting more efficient logistics practices. Waste seems to be taken for granted on construction projects and to a large extent is embedded in the project costing, so that quantities are based on an expectation that there will be significant damage and other losses (Ballard 2010).

So we suggest that construction UCCs based on controlled building sites, and which can save such a huge amount of waste, are a good example of how construction centres can be developed and run by the private sector and here the facilitation of the centres by transport planners could yield great benefits.

3. SUMMARY AND CONCLUSIONS

It is argued that consolidation centres reduces the number of vehicles travelling into urban areas and provide an efficient way for freight operators to service such environments. As planning and environmental obligations increase, such centres will become more important in order to deliver both efficiency and financial savings in the future.

We aimed to show that planner-led UCC solutions are untenable in the modern liberal economy and that the top down imposition of a Urban Consolidation Centre (UCC) works only in clearly controlled domains. We have studied urban freight concepts and practice and it is our contention that most UCC initiatives fail in a liberal economy where free choice and market economics apply. In underpinning this contention we have compiled, analysed and categorised a set of the UCC schemes known to have operated, left evidence of their existence, and been captured by the research community.

In this paper we have presented two case study examples that show that within the construction sector, UCCs can be utilised to create efficient and forward-thinking logistics operations. Whilst it might be true for the construction sector, we have not found evidence that it might be true for other sectors. The question of whether or not a UCC could operate without subsidy is one that remains unanswered.

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